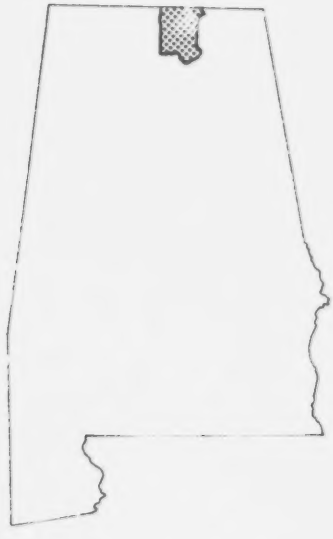
DEC 6 1990

FLOOD INSURANCE STUDY

MADISON COUNTY, ALABAMA

UNINCORPORATED AREAS



REVISED

FEBRUARY 6, 1991

Federal Emergency Management Agency

COMMUNITY NUMBER–010151

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

This publication incorporates revisions to the original Flood Insurance Study. These revisions are presented in Section 9.0.

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EXHIBITS

Flood Profiles

Flint River	Panels 01P-07P
Brier Fork Flint River	Panels 08P-09P
Beaverdam Creek	Panel 10P
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Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the unincorporated areas of Madison County, Alabama, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Madison County to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Streams requiring detailed study were identified at a time and cost coordination meeting attended by representatives of the Federal Insurance Administration, Madison County, and the study contractor in December 1977. Significant flooding sources were determined to be Flint River, Brier Fork Flint River, Beaverdam Creek, and Indian Creek.

Additional flood information concerning the streams studied was obtained from interviews with local citizens, newspaper file searches, and field investigations conducted by the study contractor during and following recent, major floods.

The results of this study were reviewed at a final community coordination meeting held on August 5, 1980. Attending the meeting were representatives of the Federal Insurance Administration, the study contractor, and the county. No problems were raised at the meeting.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the Tennessee Valley Authority, for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-15-78, Project Order No. 1. This work, which was completed in June 1979, covered all significant flooding sources affecting the unincorporated areas of Madison County.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Madison County, Alabama. The area of study is shown on the Vicinity Map (Figure 1).

Not included in this study are the Cities of Huntsville and Owens Cross Roads, and the Towns of Gurley, Madison, New Hope, and Triana.

Floods caused by overflow from the following streams were studied by detailed methods:

Stream	Miles
Flint River	5.14-12.06
Brier Fork Flint River	0.05-4.19
Beaverdam Creek	0-2.78
Indian Creek	12.84-17.52

These four streams are the only significant flooding sources affecting the unincorporated areas of Madison County.

Approximate methods of analysis were used to study those areas having a low development potential or a minimal flood hazard.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1984.

2.2 Community Description

Madison County is in north-central Alabama, approximately 70 miles southwest of Chattanooga, Tennessee, and 170 miles north of Montgomery, Alabama.

The population of Madison County in 1960 was 117,348; in 1970, 186,540; and in 1976, 184,900. The total land area of the county is 803 square miles.

Huntsville is the county seat and largest city in Madison County. The estimated 1975 population of Huntsville was 136,419. Madison is the second largest community in the county, with an estimated population of 3286 in 1975.

The 1978 assessed valuation of Madison County property was $290,970,520. According to the 1972 Census of Retail Trade, there were 1482 retail establishments in the county reporting total annual sales of $412,426,000 (Reference 1).

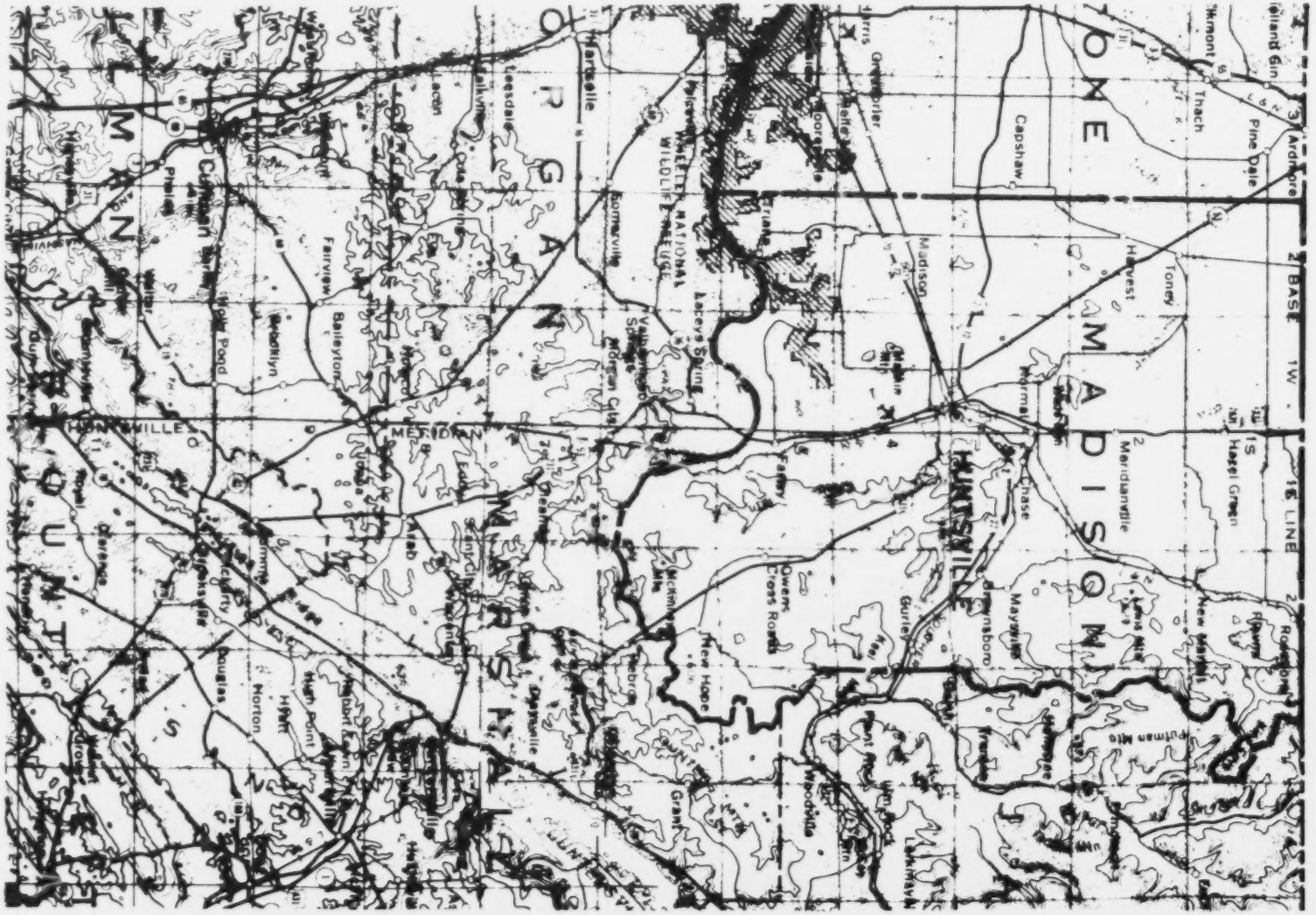


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

8 0 8 16 24 MILES

3

VICINITY MAP

In 1977, there were 236 manufacturing firms in Madison County employing approximately 19,700 workers with an annual payroll in excess of $228 million.

Tennessee River forms the southern boundary of Madison County; a portion of the State of Tennessee bounds the county on the north. Throughout western Madison County there are broad, rolling hills of slight to moderate relief with elevations ranging from 600 to 800 feet. Eastern Madison County is characterized by much greater relief, with hills ascending to elevations of 1600 feet (Reference 2).

Flint River, originating in Tennessee, flows southerly into Madison County through broad, agricultural valleys. Its total drainage area is 568 square miles and includes most of north-central, northeastern, and east-central Madison County. Its largest tributary is Brier Fork Flint River, which drains a 112-square-mile area north of Huntsville. The largest tributary of Brier Fork Flint River is Beaverdam Creek, with a drainage area of 48.6 square miles (Reference 2).

Indian Creek has a total drainage area of 193 square miles; however, the reach covered in this study drains only 49 square miles. This includes portions of the western part of Huntsville and areas west of the City of Huntsville.

Madison County has a mild, temperate climate. The average annual temperature is 62°F. The average summer temperature is 80°F, and the average winter temperature is 46°F. At Huntsville the highest recorded temperature is 106°F; the lowest is -7°F.

The average annual precipitation in the county is approximately 52 inches. Heavy rains generally occur between December and April. Periods of minimal rainfall occur in August and September (Reference 2).

Soils are derived from sedimentary rocks, and, except for alluvial deposits, are moderately well to extremely well drained. Approximately one-third of the county is forested, mostly on mountain slopes (Reference 3).

2.3 Principal Flood Problems

The March 16, 1973, flood was the largest to occur on Flint River since 1867. The flood reached an elevation of 582.2 feet, with a recurrence interval of approximately 230 years at River Mile 8.5. The Flint River valley, which is primarily in agricultural use, sustained only minor crop damage since most of the 1972 crop had been harvested. There was considerable damage to fields, fences, and many roads in the area (Reference 4).

The flood of March 12, 1963, caused widespread property damage throughout the basin. There was minor crop damage, because most of the 1962 crop had been harvested, but many miles of fence and secondary road were damaged (Reference 5). Discharge and elevation data are not available for this flood.

The March 16, 1973, flood was the largest flood on Indian Creek during the period of record beginning in 1959. The flood reached an elevation of 631.0 feet at River Mile 14.5 with a recurrence interval of 240 years. Although the Indian Creek flood plain was not developed, damage to roads was heavy. Approximately 1100 feet of the Madison Pike Road and bridge were inundated, and the approaches to one county road bridge were inundated by up to 5.5 feet of water. The bridge sustained minor damage (Reference 4).

Elevation and damage data are not available for Brier Fork Flint River or Beaverdam Creek.

2.4 Flood Protection Measures

Southern Madison County is affected by Tennessee River. The system of reservoirs operated by the Tennessee Valley Authority on Tennessee River now totals 33 major projects, of which 21 are multiple-purpose projects. Sixteen of these multiple-purpose projects are located upstream of Madison County. Fourteen of these upstream projects reserve storage space for the control of floodflows. Their combined effect greatly reduces flood damage at many locations in the Tennessee River basin.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the county at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the county.

The U.S. Geological Survey gaging station No. 03575000 on Flint River near Chase was the principal source of data for defining discharge-frequency relationships for Flint River. The gage has been in operation since 1929. A flood-frequency relationship was developed from the record using the procedure outlined by the U.S. Water Resources Council (Reference 6). The transfer of the discharge-frequency relationships downstream was determined by comparsion with the available historic flood profiles.

Stream gaging stations have not been maintained on Brier Fork Flint River or Beaverdam Creek. Discharge-frequency relationships for these streams were estimated using relationships of peak discharge and drainage area developed from analysis of records on nearby gaging stations, which are listed in Table 1.

The U.S. Geological Survey gaging station No. 03575830 on Indian Creek near Madison was the principal source of data for defining discharge-frequency relationships for Indian Creek. The gage has been in operation since 1959. The discharge-frequency relationships were transferred downstream based upon flow-drainage relationships using the same slope as regional relationships.

Frequency curves for the gaged locations used to define regional relationships were computed using the procedure outlined by the U.S. Water Resources Council (Reference 6) and historic flood information where available. The adopted flow estimates were compared with results obtained using the 1973 U.S. Geological Survey relationships (Reference 7). U.S. Geological Survey flow estimates were 30 percent smaller than the adopted estimates. Differences result from using gage records through 1978 in this study compared to records through 1971 for the U.S. Geological Survey report.

Peak discharge-drainage area relationships for Flint River, Brier Fork Flint River, Beaverdam Creek, and Indian Creek are shown in Table 2.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the county were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in the county.

Table 1. Stream Gages

Stream	Gage Number[1]	Drainage Area (Square Miles)	Period of Record
Vest Creek Near Baldwin, Alabama	02451750	1.64	1964-1972
Big Huckleberry Creek Near Belvedere, Tennessee	03574700	2.18	1955-1974
Flat Branch Near Jasper, Alabama	02045340	2.47	1958-1969
Weakly Creek Near Rover, Tennessee	0359820	9.46	1955-1977
Dorsey Creek Near Arkadelphia, Alabama	02450200	13.0	1959-1974
Big Bigby Creek At Sandy Hook, Tennessee	03060050	17.5	1953-1976
Weakley Creek, Near Bodenham, Tennessee	03583500	24.4	1955-1968
Bear Creek At Posey Mill, Alabama	03591700	26.8	1964-1975
W.F. Mulberry Creek At Mulberry, Tennessee	03581500	41.2	1954-1976
Bradley Creek At Prairie Plains, Tennessee	03578500	41.3	1952-1976
Indian Creek Near Madison, Alabama	03575830	49.0	1959-1977
Piney Creek Near Athens, Alabama	03576400	55.8	1960-1970

[1]U.S. Geological Survey

Table 1. Stream Gages (Cont'd)

Stream	Gage Number	Drainage Area (Square Miles)	Period of Record
Elk River Near Pelham, Tennessee	03578000[1]	65.6	1952-1976
Little Bear Creek Near Halltown, Alabama	03592300[1]	78.2	1958-1976
Flint Creek Near Falkville, Alabama	03576500[1]	86.3	1953-1973
Limestone Creek Near Athens, Alabama	03576250[2]	119	1940-1966 1966-1976
Bear Creek Near Hackleburg, Alabama	03572900[1]	143	1957-1976
Town Creek Near Geraldine, Alabama	03591800[1]	141	1958-1976
Cypress Creek Near Florence, Alabama	03590000[1]	209	1934-1953
Paint Rock River Near Woodville, Alabama	03574500[1]	320	1936-1976
Flint River Near Chase, Alabama	03575000[1]	342	1929-1977

[1]U.S. Geological Survey
[2]Tennessee Valley Authority

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Flint River[1]					
At Mouth	568	28,000	52,000	64,000	105,000
At River Mile 4.8	557	28,500	52,500	65,000	108,000
At River Mile 7.4	542	29,000	54,000	66,000	109,000
At River Mile 10.25	530	29,500	54,500	67,000	110,000
Brier Fork Flint River					
At Mouth	112	17,000	31,000	38,000	58,000
At River Mile 4.2	96.9	15,000	27,800	33,800	51,000
Beaverdam Creek					
At Mouth	48.6	8,800	16,500	20,000	30,000
At River Mile 2.8	41.6	7,800	15,000	18,000	27,000
Indian Creek					
At River Mile 12.80	49.0	6,800	11,000	13,000	18,000
At River Mile 17.52	39.6	5,730	9,340	11,050	15,180

[1]Downstream Decreases in Peak Discharges Are Caused by Channel Storage

Water-surface elevations of floods for the selected recurrence intervals were computed through use of the U.S. Army Corps of Engineers HEC-2N backwater program (Reference 8) and a similar backwater program developed by the Tennessee Valley Authority (Reference 9).

Cross sections for Flint River, Brier Fork Flint River, and Beaverdam Creek were obtained by photogrammetric methods using aerial photographs at a scale of 1:9600 (Reference 10), while those for Indian Creek were field surveyed. Cross sections at bridges, dams, and culverts were field surveyed for structural geometry and elevation data.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel and overbank roughness factors (Manning's "n") were determined by field inspection of channel and flood plain areas, from previous studies by the Tennessee Valley Authority and from computed coefficients based on known flood profiles. The ranges of values for Manning's "n" are as follows:

Stream	Channel	Overbank
Flint River	0.040-0.060	0.110-0.125
Brier Fork Flint River	0.045-0.055	0.060-0.120
Beaverdam Creek	0.055-0.060	0.120-0.150
Indian Creek	0.028-0.040	0.050-0.130

Starting elevations for the headwater floods on Flint River and Brier Fork Flint River were obtained by slope-area calculation. The controlling elevations on the lower end of Brier Fork Flint River were obtained by starting the computations at the 10-, 50-, 100-, and 500-year flood elevations on Flint River. This was based on the hydrologic assumption of concurrent flooding on the two streams. The controlling elevations at the lower end of Flint River were computed by joint probability between the Tennessee River flood elevations and the Flint River headwater flood elevations.

Starting elevations on Beaverdam Creek were obtained from the upper end of Brier Fork Flint River. Indian Creek starting elevations were obtained from the gage rating at River Mile 12.8.

For the streams studied by approximate methods, the depth of the 100-year flood was developed from normal-depth calculations.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Note that an apparent extra 1.2-mile length of stream exists at a point 10.8 miles upstream on Flint River. This is necessary to keep historic data accurate above and below this point on Flint River.

The flood elevations as shown on the profiles are considered valid only if hydraulic structures, in general, remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation Reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, except for Indian Creek, the boundaries were developed photogrammetrically, using aerial photographs at a scale of 1:9600 (Reference 10). Flooded areas for Indian Creek between cross sections were interpolated using topographic maps at a scale of 1:24,000, enlarged to a scale of 1:6,000, with a contour interval of 10 feet (Reference 11).

In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown.

The boundaries for streams studied by approximate methods were delineated on the topographic maps referenced above.

Approximate flood boundaries in some portions of the study area were taken from the Federal Insurance Administration's Flood Hazard Boundary Map (Reference 12).

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2).

Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. As minimum standards, the Federal Insurance Administration limits such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodways for this study were computed by setting encroachments in the stream overbanks, testing these with the backwater program, and adjusting and retesting them until an allowable increase in flood elevation was reached. This procedure has been used by the study contractor for many years to provide technical flood plain management assistance to Tennessee Valley communities. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 3).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood boundaries are close together, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
FLINT RIVER								
A	5.14	3500	39,486	1.6	577.8	573.4[3]	573.9	0.5
B	5.72	3200	28,059	2.3	578.2	575.1[3]	575.8	0.7
C	6.45	4550	48,143	1.4	578.7	577.2[3]	578.0	0.8
D	6.98	3300	30,534	2.2	579.3	578.2[3]	579.1	0.9
E	8.66	3960	39,812	1.7	581.3	580.9[3]	581.9	1.0
F	9.09	3700[2]	37,124	1.8	582.3	582.3	583.2	0.9
G	9.65	5000[2]	45,912	1.5	583.8	583.8	584.5	0.7
H	10.20	4850[2]	44,735	1.5	585.2	585.2	586.0	0.8
I	10.50	5150[2]	50,281	1.3	585.9	585.9	586.7	0.8
J	10.61	5060[2]	48,509	1.4	586.3	586.3	587.0	0.7
K	12.06	4750[2]	53,692	1.3	586.6	586.6	587.4	0.8
L	12.08	4750	54,691	1.3	587.2	587.2	588.2	1.0
M	12.88	2200	22,854	3.0	588.1	588.1	589.0	0.9
N	13.99	4130	39,305	1.8	590.9	590.9	591.8	0.9
O	15.56	5000	44,246	1.6	594.9	594.9	595.7	0.8
P	16.02	4500	46,555	1.5	597.7	597.7	598.1	0.4
Q	17.75	4930	50,767	1.4	600.6	600.6	601.5	0.9
R	18.06	5050	72,007	1.0	601.6	601.6	602.5	0.9
S	18.30	5060	45,748	1.6	601.9	601.9	602.9	1.0
T	19.98	5000	44,039	1.7	606.3	606.3	607.3	1.0
U	21.79	4110	41,005	1.8	610.7	610.7	611.6	0.9

[1]MILES ABOVE MOUTH
[2]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED
[3]ELEVATIONS WITHOUT CONSIDERING OVERFLOW EFFECT FROM TENNESSEE RIVER

REVISED: 02/06/91

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

FLOODWAY DATA

FLINT RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
BRIER FORK FLINT RIVER								
A	0.05	280	4565	8.3	674.0	668.3[2]	668.3	0.0
B	0.10	250	4510	8.4	674.7	669.5[2]	669.6	0.1
C	0.15	540	7049	5.4	675.3	673.3[2]	674.3	1.0
D	0.26	670	7719	4.9	676.1	674.6[2]	675.5	0.9
E	0.47	500	7217	5.2	678.3	677.7[2]	678.3	0.6
F	1.00	900	13,768	2.7	681.5	681.3[2]	682.3	1.0
G	1.40	750	11,510	3.3	683.1	682.9[2]	683.9	1.0
H	1.72	900	9298	4.0	685.5	685.4[2]	686.2	0.8
I	1.97	1140	17,131	2.2	687.1	687.0[2]	688.0	1.0
J	2.31	1220	15,543	2.4	687.9	687.9	688.9	1.0
K	2.58	1570	11,419	3.2	688.4	688.4	689.4	1.0
L	3.09	1700	16,427	2.2	691.6	691.6	692.4	0.8
M	3.42	1200	10,962	3.3	693.2	693.2	693.9	0.7
N	3.54	1100	10,617	3.2	694.7	694.7	695.1	0.4
O	3.70	700	7114	4.8	696.1	696.1	696.6	0.5
P	3.90	360	5144	6.6	698.6	698.6	699.5	0.9
Q	4.19	460	8123	4.2	703.4	703.4	704.2	0.8
BEAVERDAM CREEK								
A	0.66	490	5978	3.3	704.7	704.7	705.7	1.0
B	1.03	575	6786	2.9	707.4	707.4	708.2	0.8
C	1.35	715	8692	2.3	709.9	709.9	710.8	0.9
D	1.70	720	9270	2.0	711.8	711.8	712.8	1.0
E	2.78	1400	13,487	1.3	718.3	718.3	719.1	0.8

[1]MILES ABOVE MOUTH
[2]ELEVATIONS WITHOUT CONSIDERING OVERFLOW EFFECT FROM FLINT RIVER

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

FLOODWAY DATA

BRIER FORK FLINT RIVER—BEAVERDAM CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
INDIAN CREEK								
A	13.08	1010	5880	2.1	616.0	616.0	616.9	0.9
B	13.98	1000[2]	6670	1.9	625.7	625.7	626.1	0.4
C	16.86	330	2340	4.8	658.3	658.3	659.2	0.9
D	17.52	410	3540	3.1	668.9	668.9	669.5	0.6

[1]FEET ABOVE MOUTH
[2]THIS WIDTH EXTENDS WITHIN AREA NOT INCLUDED

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

FLOODWAY DATA

13

INDIAN CREEK

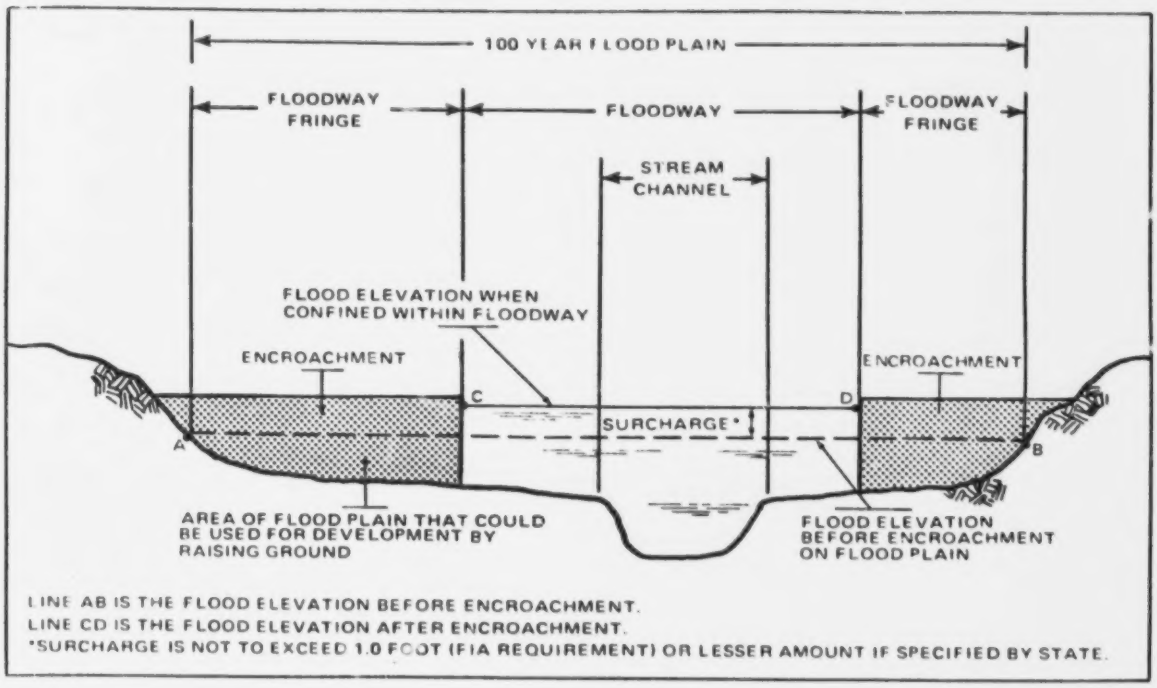

100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 2. Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting the unincorporated areas of Madison County.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of Madison County are shown on the Flood Profiles (Exhibit 1) and summarized in Table 4.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the unincorporated areas of Madison County were divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or Flood Hazard Factors determined.
Zones A4, A5, A7, A10, and A12:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
FLINT RIVER							
REACH 1	0442,0453,0454 0461,0462	-3.7	-1.2	3.2	035	A7	VARIES—SEE MAP
REACH 2	0350,0453,0475	-4.0	-2.9	7.9	040	A8	VARIES—SEE MAP
BRIER FORK FLINT RIVER							
REACH 1	0184,0203	-6.0	-1.9	5.6	060	A12	VARIES—SEE MAP
REACH 2	0182,0184	-3.7	-1.2	3.0	035	A7	VARIES—SEE MAP
REACH 3	0181,0182,0184	-4.9	-1.3	3.0	050	A10	VARIES—SEE MAP
BEAVERDAM CREEK							
REACH 1	0177,0179,0181 0183	-4.9	-1.3	2.9	050	A10	VARIES—SEE MAP
INDIAN CREEK							
REACH 1	0279	-1.8	-0.7	2.0	020	A4	VARIES—SEE MAP
REACH 2	0277	-2.2	-0.6	1.2	020	A4	VARIES—SEE MAP
REACH 3	0164,0277	-2.4	-0.7	1.2	025	A5	VARIES—SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

REVISED 2/4/91

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

FLINT RIVER—BRIER FORK FLINT RIVER—BEAVERDAM CREEK—INDIAN CREEK

to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

The flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the county are summarized in Table 4.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the unincorporated areas of Madison County is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

Data concerning Indian Creek that are presented on the Huntsville, Alabama, Flood Hazard Boundary Map (Reference 13) are in agreement with the Madison County Flood Insurance Study.

A Flood Insurance Study is being prepared for the Town of Owens Cross Roads, which is surrounded by Madison County (Reference 14). The results of that study were coordinated with those for Madison County.

The Federal Insurance Administration has previously published a Flood Hazard Boundary Map for Madison County (Reference 12). Due to the more detailed analyses used in this study, it supersedes the Flood Hazard Boundary Map.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, 1375 Peachtree Street, NE., Atlanta, Georgia 30309.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Department of Commerce, Bureau of the Census, Census of Retail Trade, Alabama, 1972

2. Geological Survey of Alabama, Geology and Ground Water Resources of Madison County, Alabama, 1957

3. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey, Madison County, Alabama, February 1958

4. Tennessee Valley Authority, Division of Water Control Planning, Report 0-7129, Floods of 1973 in the Tennessee River Basin, Knoxville, Tennessee, June 1974

5. Tennessee Valley Authority, Division of Water Control Planning, Report 0-6425, Floods of March 1963 in the Tennessee River Basin, Vol. 1, Knoxville, Tennessee, January 1964

6. U.S. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin 17A, June 1977

7. U.S. Department of the Interior, Geological Survey, Floods in Alabama, Magnitude and Frequency, 1973

8. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2N Water-Surface Profiles, Generalized Computer Program, Davis, California, June 1973

9. Tennessee Valley Authority, Computer Center, Step-Method Backwater Computer Program, (001-S F SA 321-099 BW (New), Chattanooga, Tennessee, January 23, 1974

10. Tennessee Valley Authority, Resource Services, Aerial Photographs, Flint River, Brier Fork Flint River, and Beaverdam Creek, Madison County, Alabama, Scale 1:9600, Chattanooga, Tennessee, Flown February 9, 1978

11. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet: Madison, Alabama (1975); Jeff, Alabama (1967); Meridianville, Alabama (1974); Maysville, Alabama (1974); New Hope, Alabama (1973); and Farley, Alabama (1964)

12. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Madison County, Alabama (Unincorporated Areas), Scale 1:24,000, July 1, 1977

13. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Huntsville, Alabama, Scale 1:24,000, November 1, 1979

14. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Owens Cross Roads, Alabama, unpublished

Tennessee Valley Authority, Reports 8 and 9, Daily Discharges at TVA Stream Gages in the Tennessee River Basin

Tennessee Valley Authority, Division of Water Control Planning, Floods on Tennessee River, Aldridge Creek, and Huntsville Spring Branch, and Tributaries in Vicinity of Huntsville, Alabama, April 1964

U.S. Department of the Interior, Geological Survey, Water Resources Data for Alabama, Annual Reports, 1934 to 1977

U.S. Department of the Interior, Geological Survey, Water Resources Data for Tennessee, Annual Reports, 1952 to 1974

9.0 REVISIONS DESCRIPTION

This section has been added to provide information regarding significant revisions made since the original Flood Insurance Study was printed. Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To ensure that any user is aware of all revisions, it is advisable to contact the community repository of flood hazard data located at the Madison County Engineering Department, 814 Cook Avenue, Huntsville, Alabama.

9.1 First Revision (Revised February 6, 1991)

a. Acknowledgments

The hydrologic and hydraulic analyses for this Revisions Description were performed by the Tennessee Valley Authority (TVA). The Federal Emergency Management Agency reviewed and accepted these data for purposes of this revision.

b. Scope

The floodplain boundaries, base flood elevations, zone designations, and floodway were revised along the Flint River from River Mile 12.06 upstream to River Mile 21.79.

c. Hydrologic and Hydraulic Analyses

Discharge-frequency for the study reach of the Flint River from River Mile 12.06 to River Mile 21.79 was determined from linear interpolation by River Mile between discharge frequency at River Mile 12.06 (the previous upstream study limit) and discharge-frequency at U.S. Geological Survey stream gage No. 03577500 at River Mile 35.9. Discharge-frequency at the stream gage site was estimated from records from 1929 to 1987 using procedures outlined by the U.S. Water Resources Council (Reference 15). To verify the adopted discharge-frequency, the frequencies of highwater marks from floods of July 1936, January 1946, January 1949, January 1954, and March 1973 within the study reach were determined from computed frequency profiles. These frequencies were consistent with frequencies of the same floods at the upstream gaging station, thus supporting the adopted discharge-frequency for the study reach. The discharges used in the revision are shown in Table 5, Revised Summary of Discharges. The downstream decrease in discharges is caused by channel and floodplain storage in the reach.

TABLE 5 - REVISED SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
FLINT RIVER*					
at mouth	568	28,000	52,000	64,000	105,000
at River Mile 4.8	557	28,500	52,500	65,000	108,000
at River Mile 7.4	542	29,000	54,000	66,000	109,000
at River Mile 10.25	530	29,500	54,500	67,000	110,000
at River Mile 12.06	517	31,000	56,000	69,000	111,000
at River Mile 17.75	476	32,850	58,910	72,440	114,440
at River Mile 21.79	470	34,000	60,720	74,580	116,580

*Downstream Decreases in Peak Discharges Are Caused by Channel Storage

The HEC-2 step-backwater computer program (Reference 16) was used to determine water-surface elevations. Roughness coefficients (Manning's "n") were estimated from field investigation and adjusted based on floodmarks. The "n" values used in the HEC-2 analyses ranged from 0.025 to 0.065 for the channel and from 0.06 to 0.17 for the overbanks. Cross sections were obtained by field survey. Flood boundaries were delineated using topographic maps at a scale of 1:24000 with a contour interval of 20 feet (Reference 17).

d. Floodways

Floodway computations for the Flint River were revised as a result of new detailed analyses performed by the TVA. The floodways for this study were designed for optimum benefit to the community. Floodway analyses were based on equal conveyance reduction and adjusted as necessary to account for the effects of existing developments and to provide functional and manageable floodways. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was revised and are presented in Table 3, Floodway Data.

e. Other Studies

The Flood Insurance Study for the Town of Owens Cross Roads, Madison County, Alabama (Reference 18) is also being revised based on the new TVA analyses. That revised study will be in agreement with this revision.

f. Flood Insurance Zones

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. This zone is as follows:

Zone A8: Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.

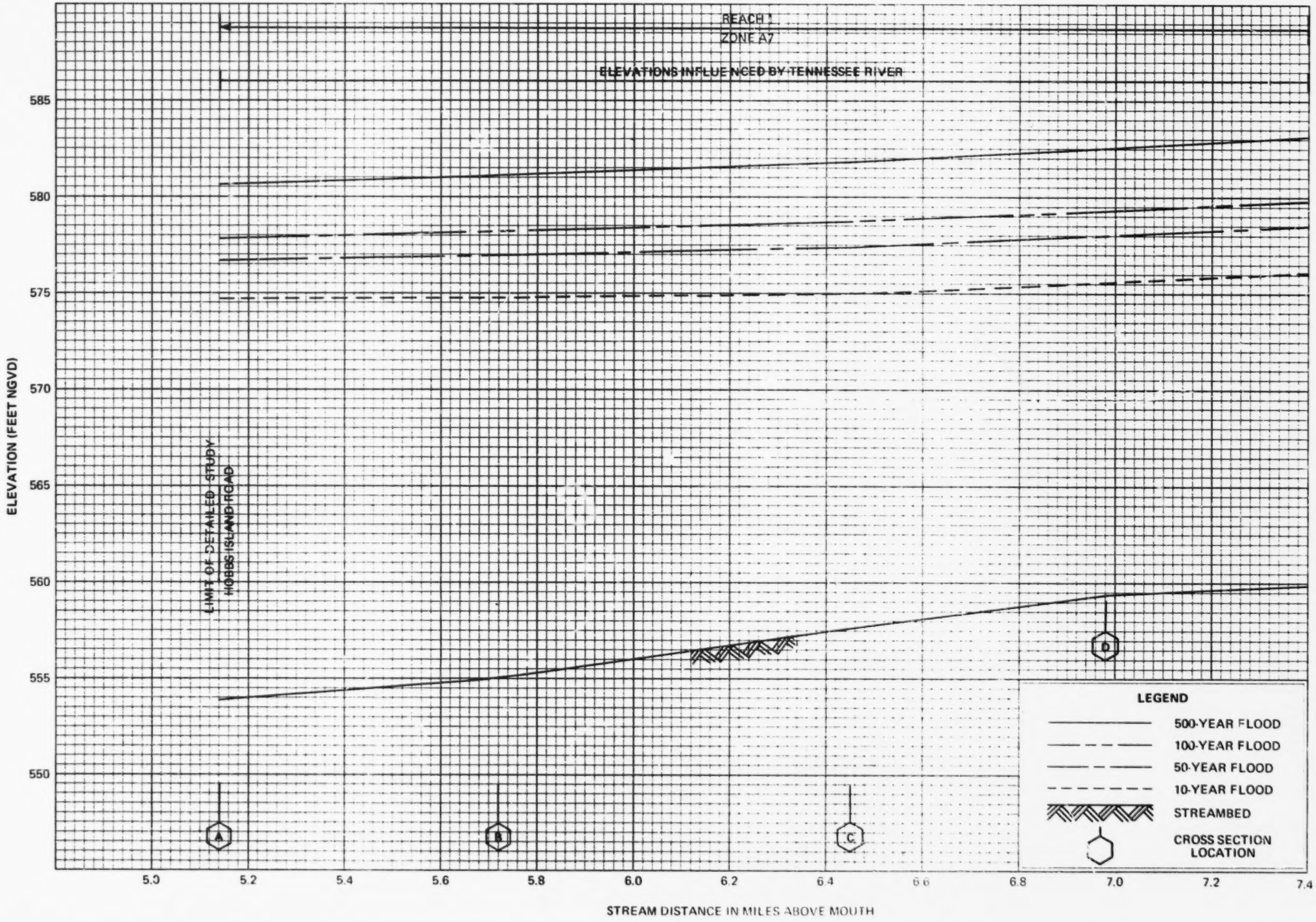
g. References and Bibliography

15. U.S. Department of the Interior, Geological Survey, Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, September 1981, revised March 1982.

16. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, November 1976, updated April 1980.

17. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 Feet: New Hope, Alabama, 1959, photorevised 1973; Moontown, Alabama, 1948, photorevised 1974.

18. Federal Emergency Management Agency, Flood Insurance Study, Town of Owens Cross Roads, Madison County, Alabama, February 1991.



FLOOD PROFILES

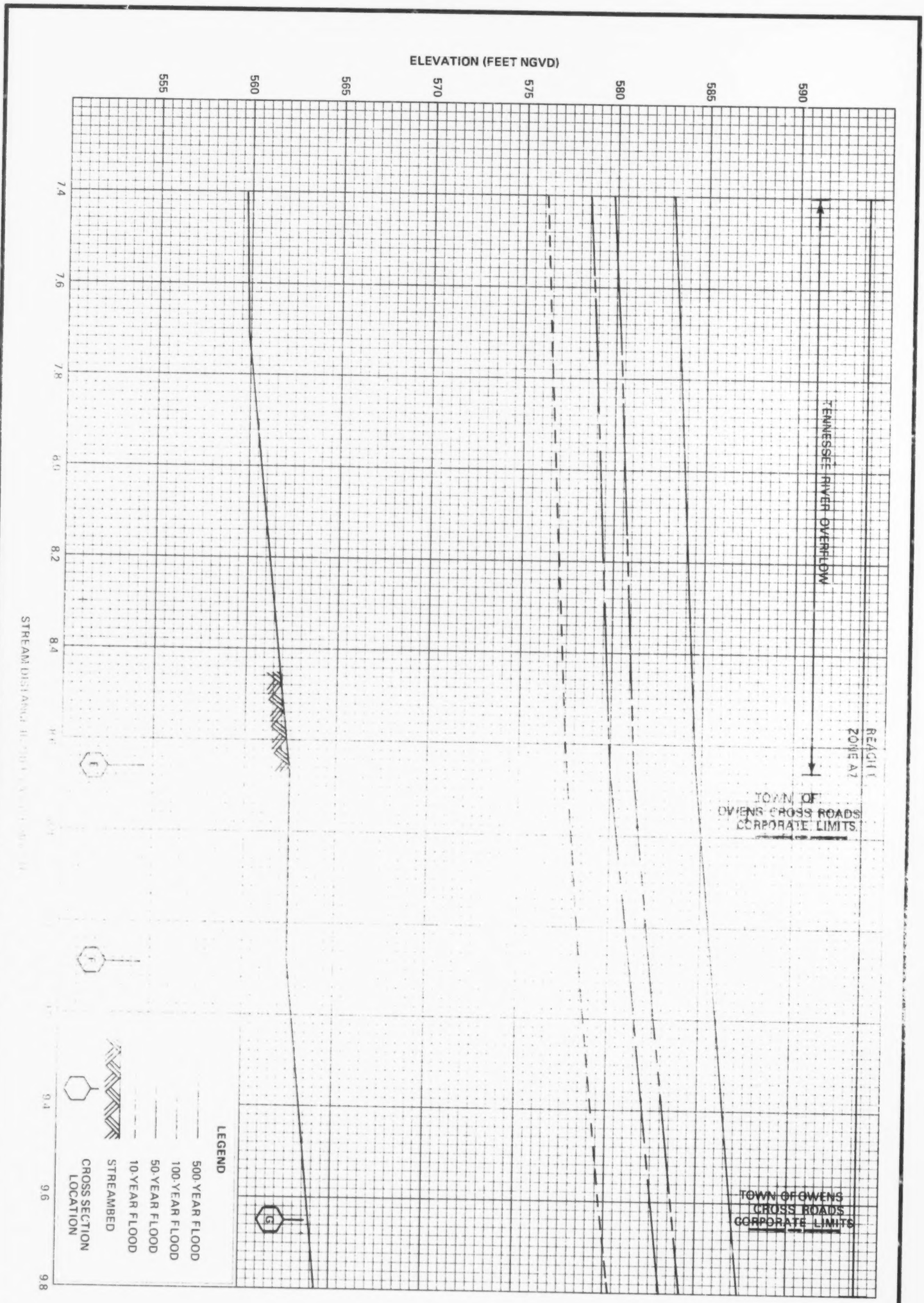
FLINT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL

(UNINCORPORATED AREAS)

01P



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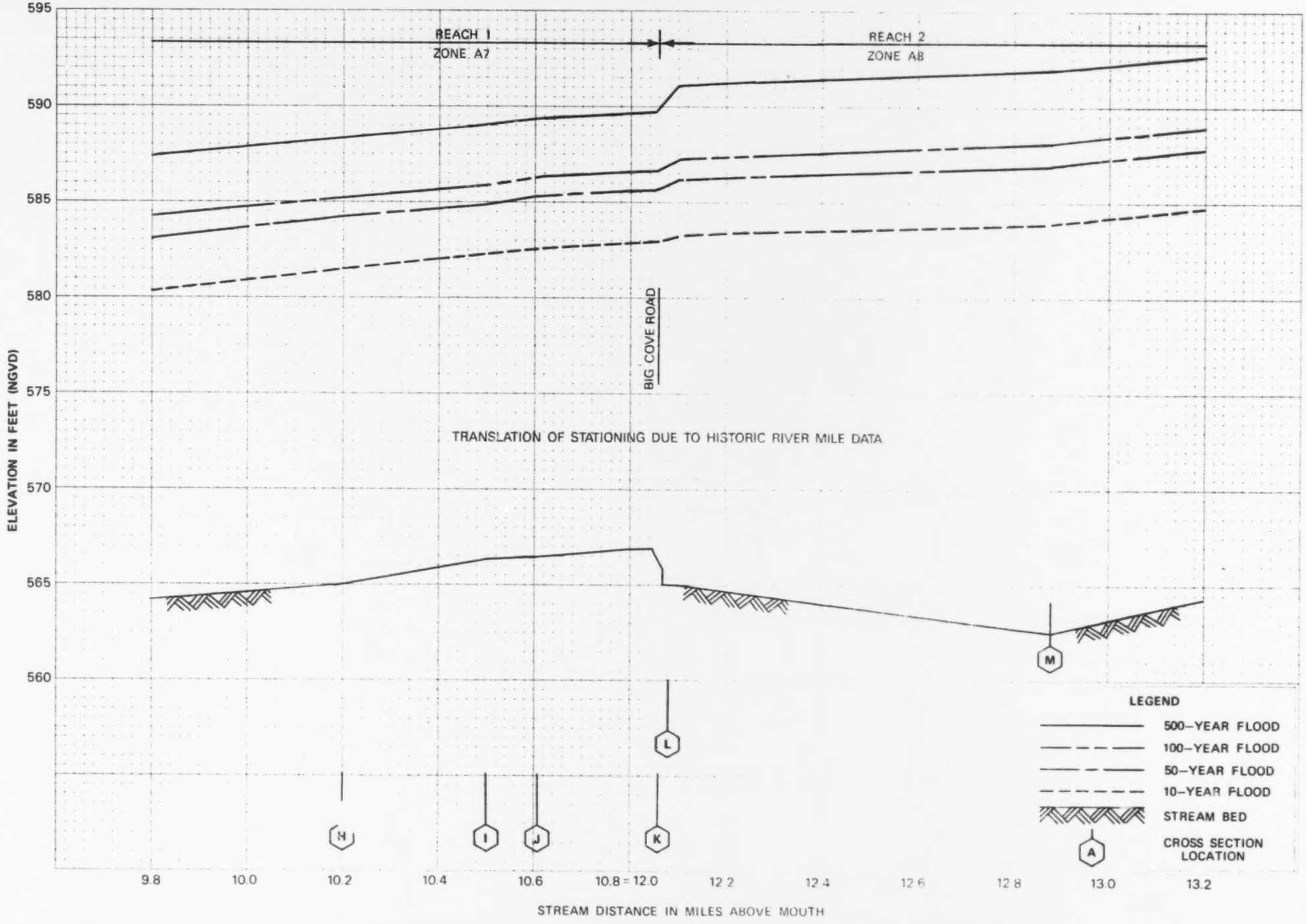
FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL

(UNINCORPORATED AREAS)

FLOOD PROFILES

FLINT RIVER



FLOOD PROFILES

FLINT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

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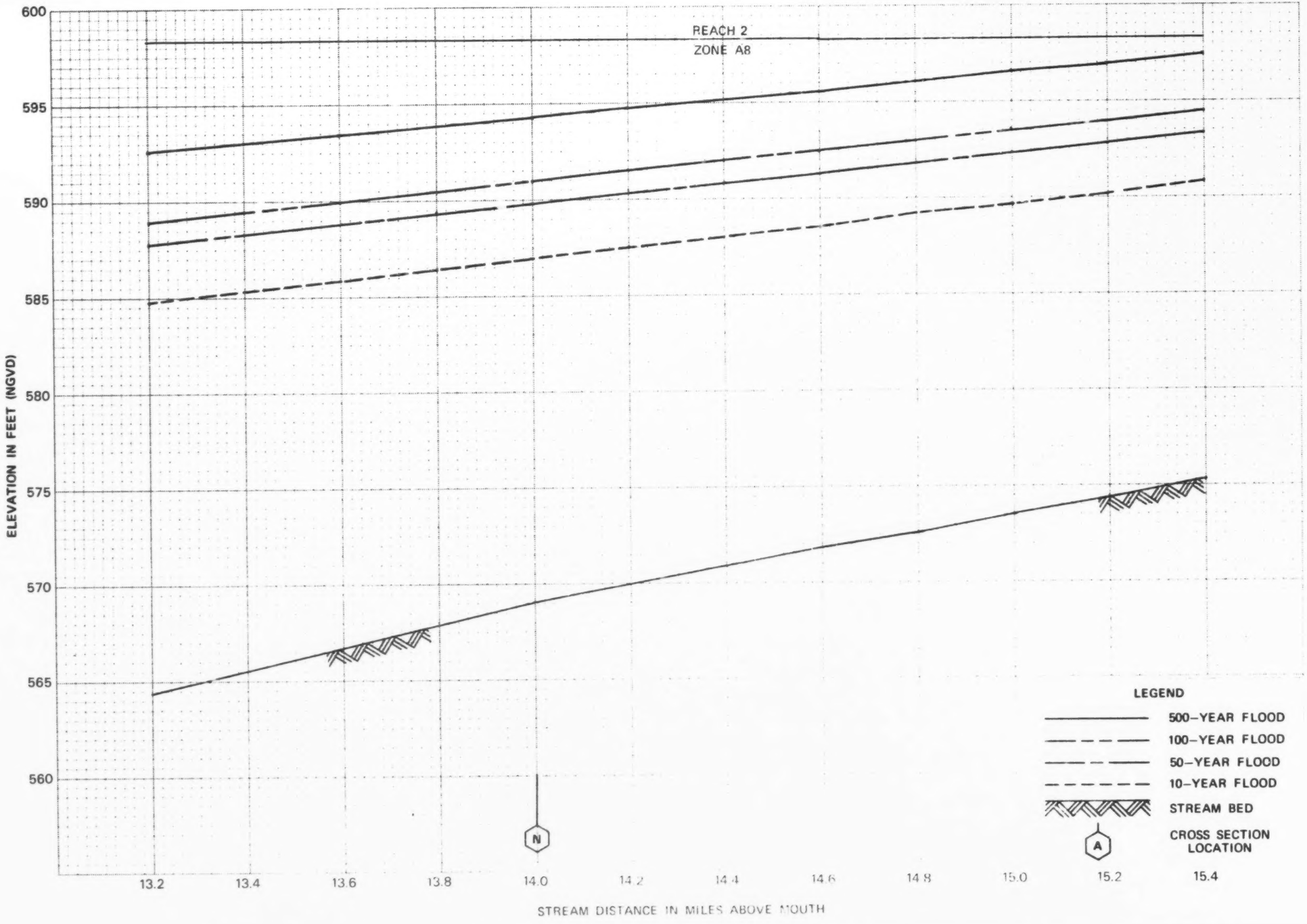

FLOOD PROFILES

FLINT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

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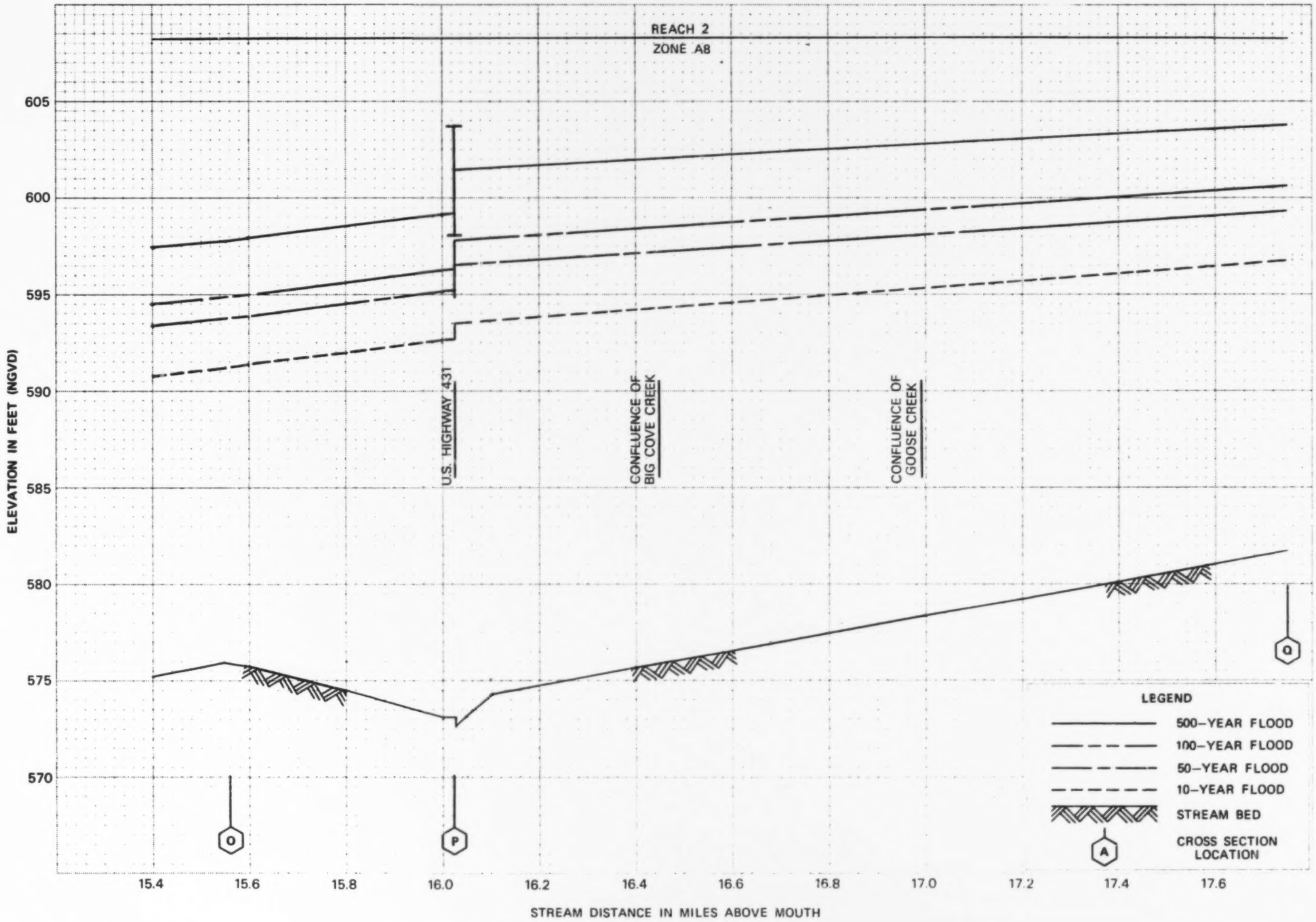

FLOOD PROFILES

FLINT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

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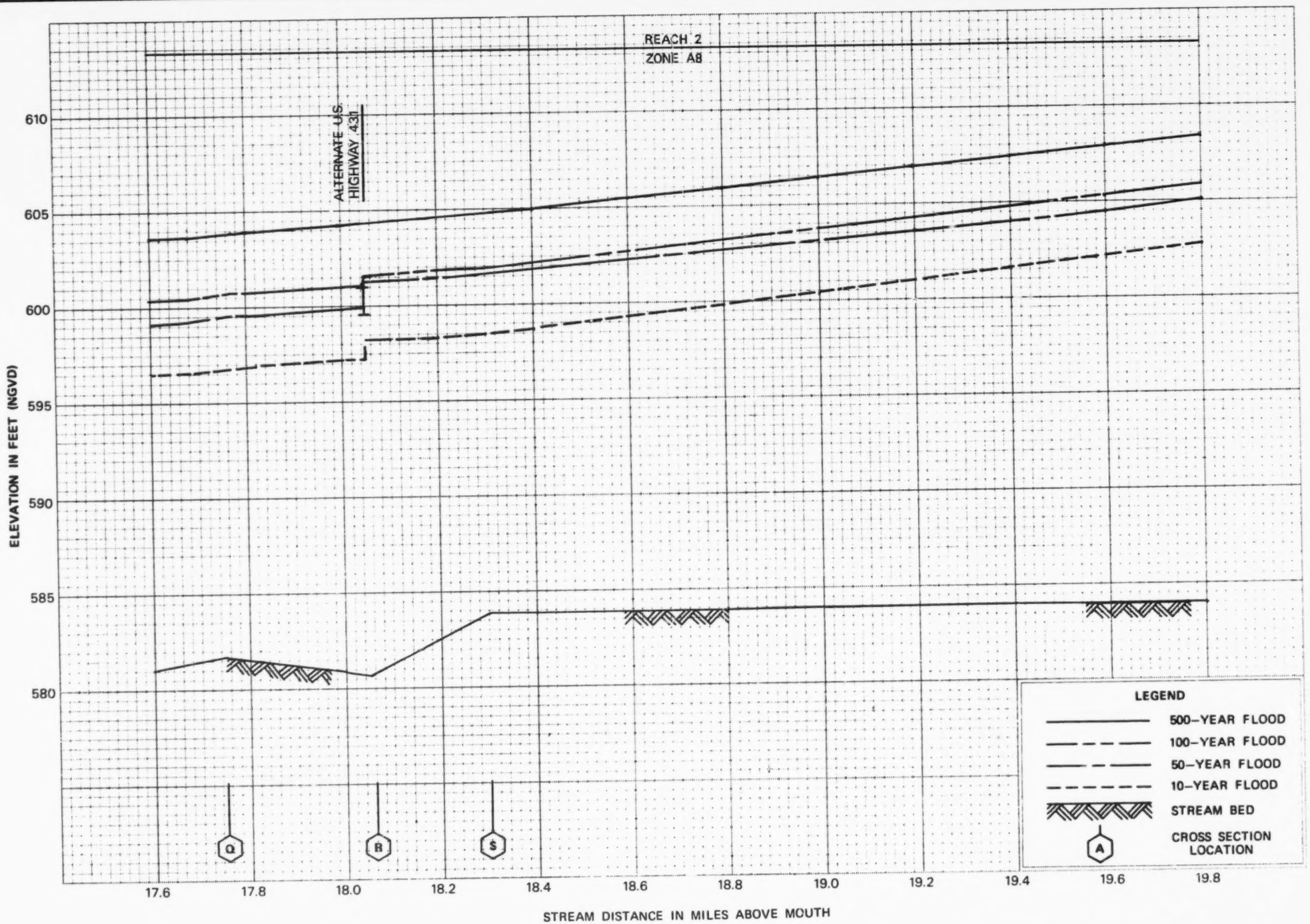

FLOOD PROFILES

FLINT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

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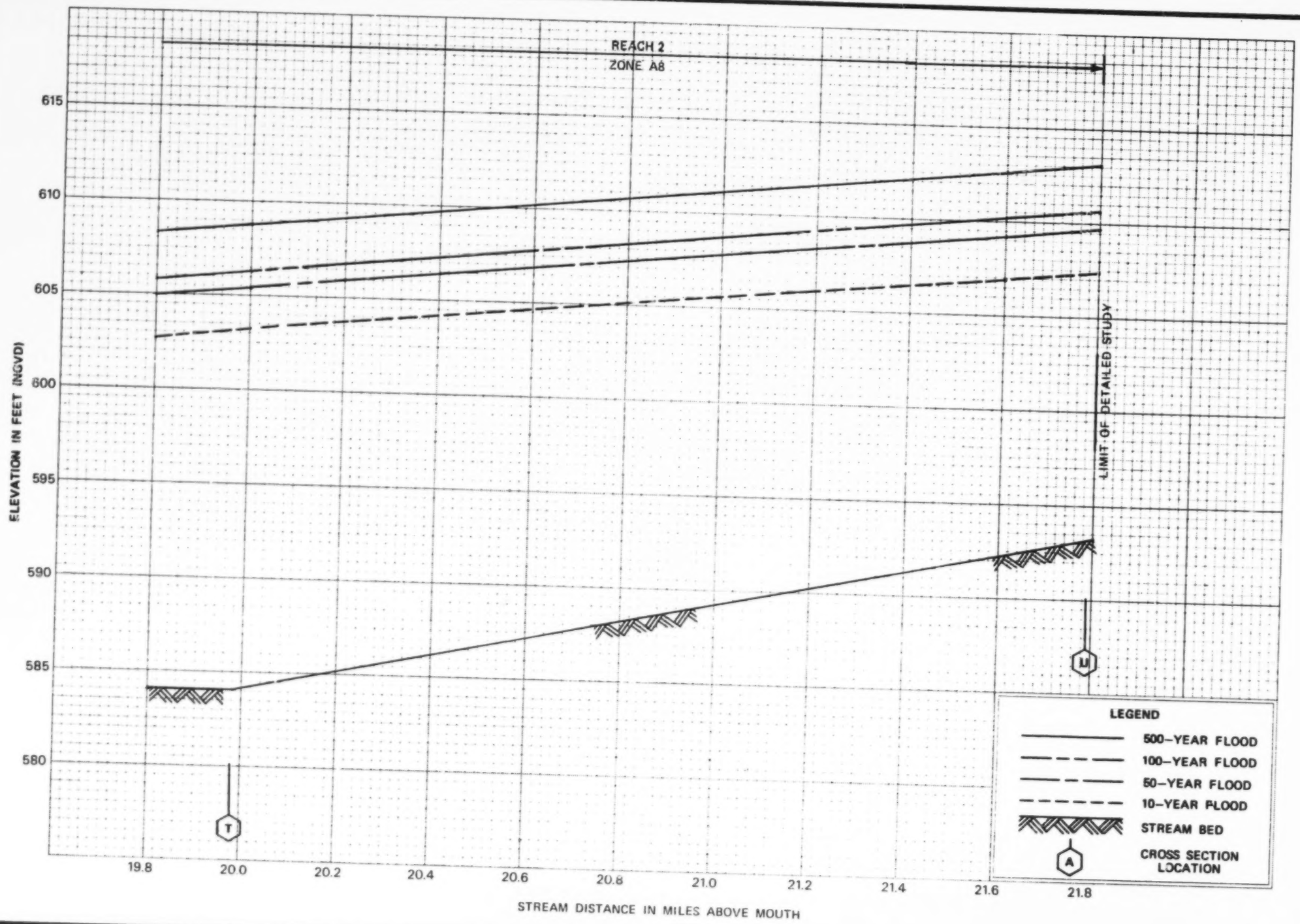

FLOOD PROFILES

FLINT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

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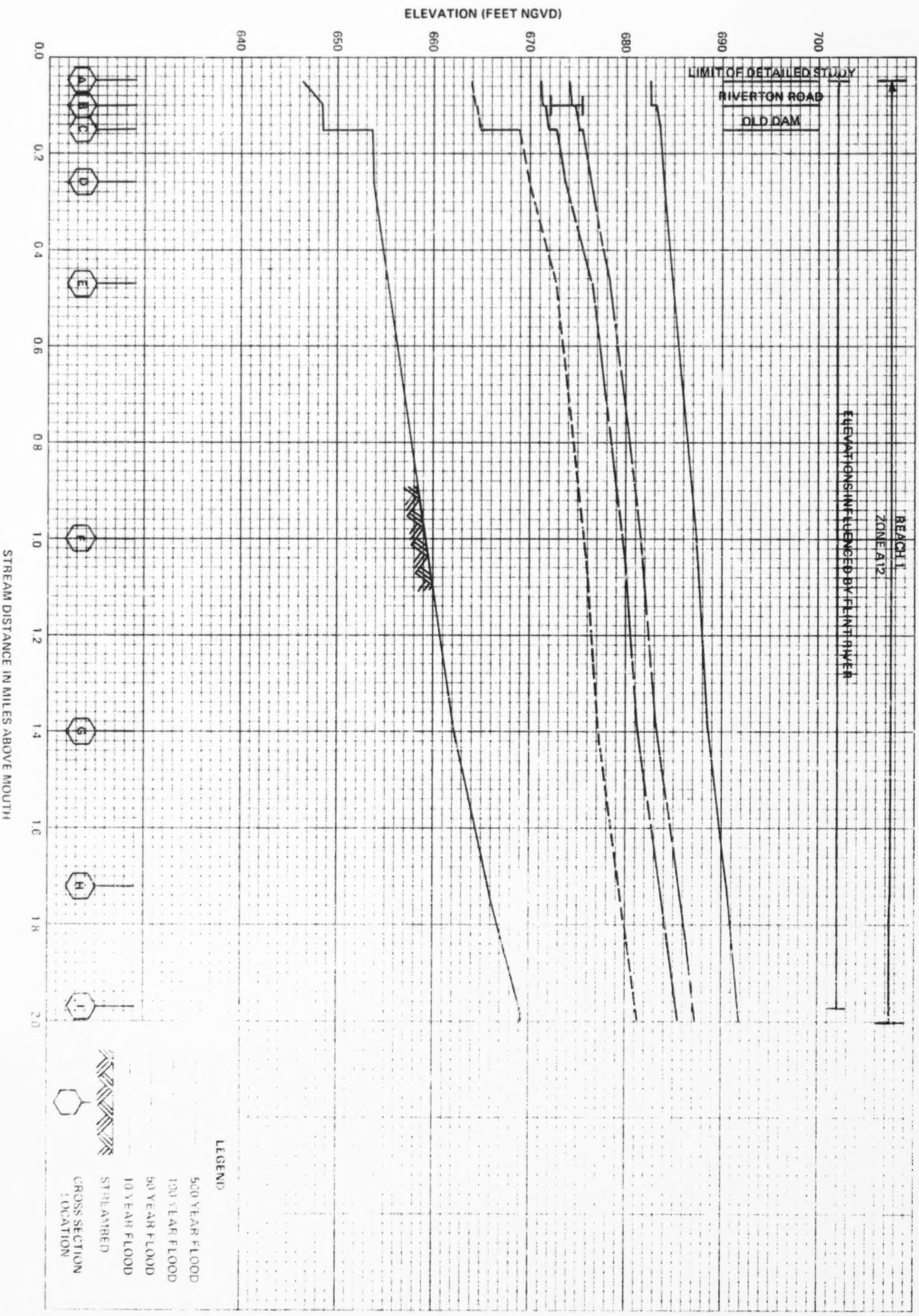

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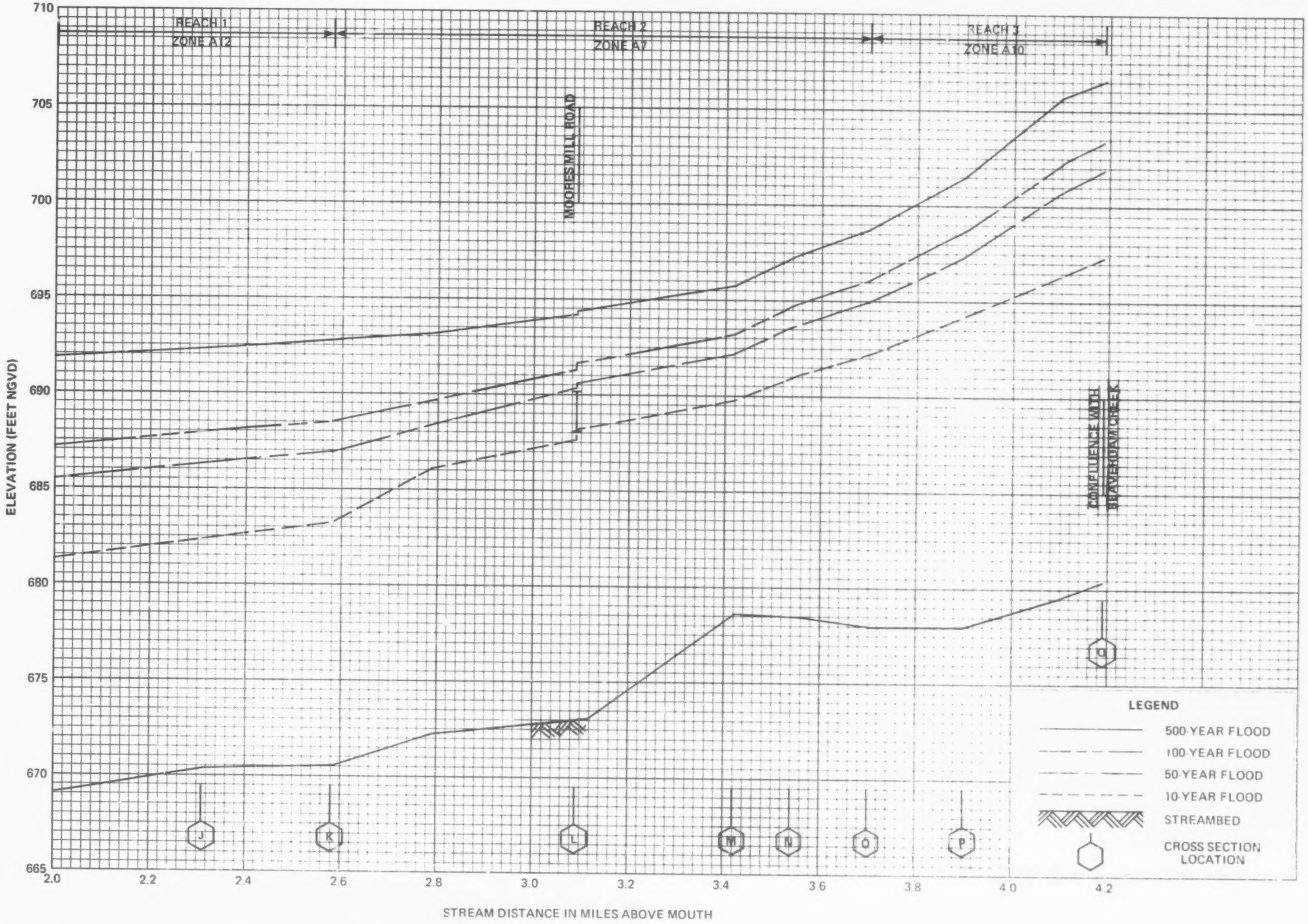
FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL

(UNINCORPORATED AREAS)

FLOOD PROFILES

BRIER FORK FLINT RIVER



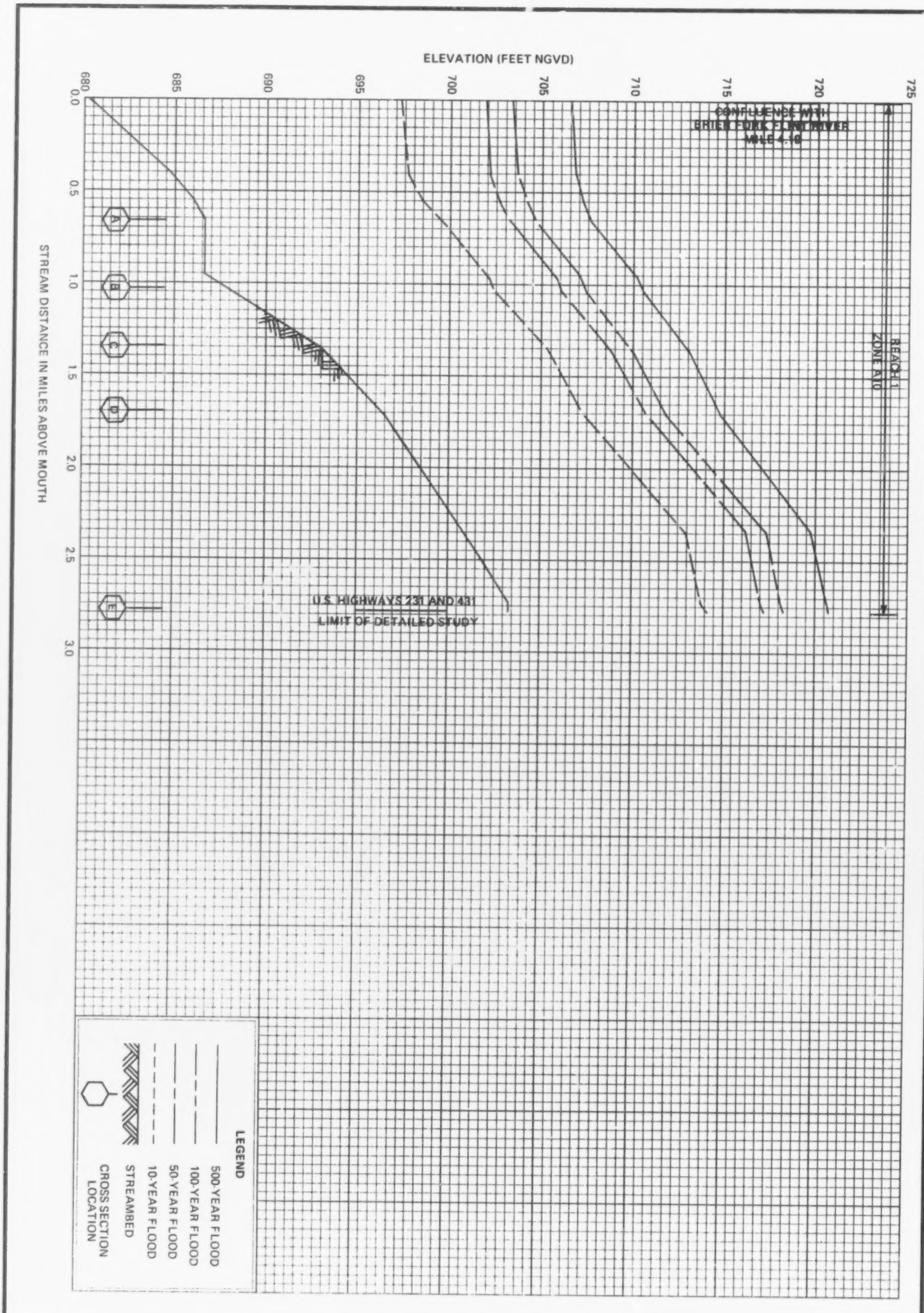
FLOOD PROFILES

BRIER FORK FLINT RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

09P



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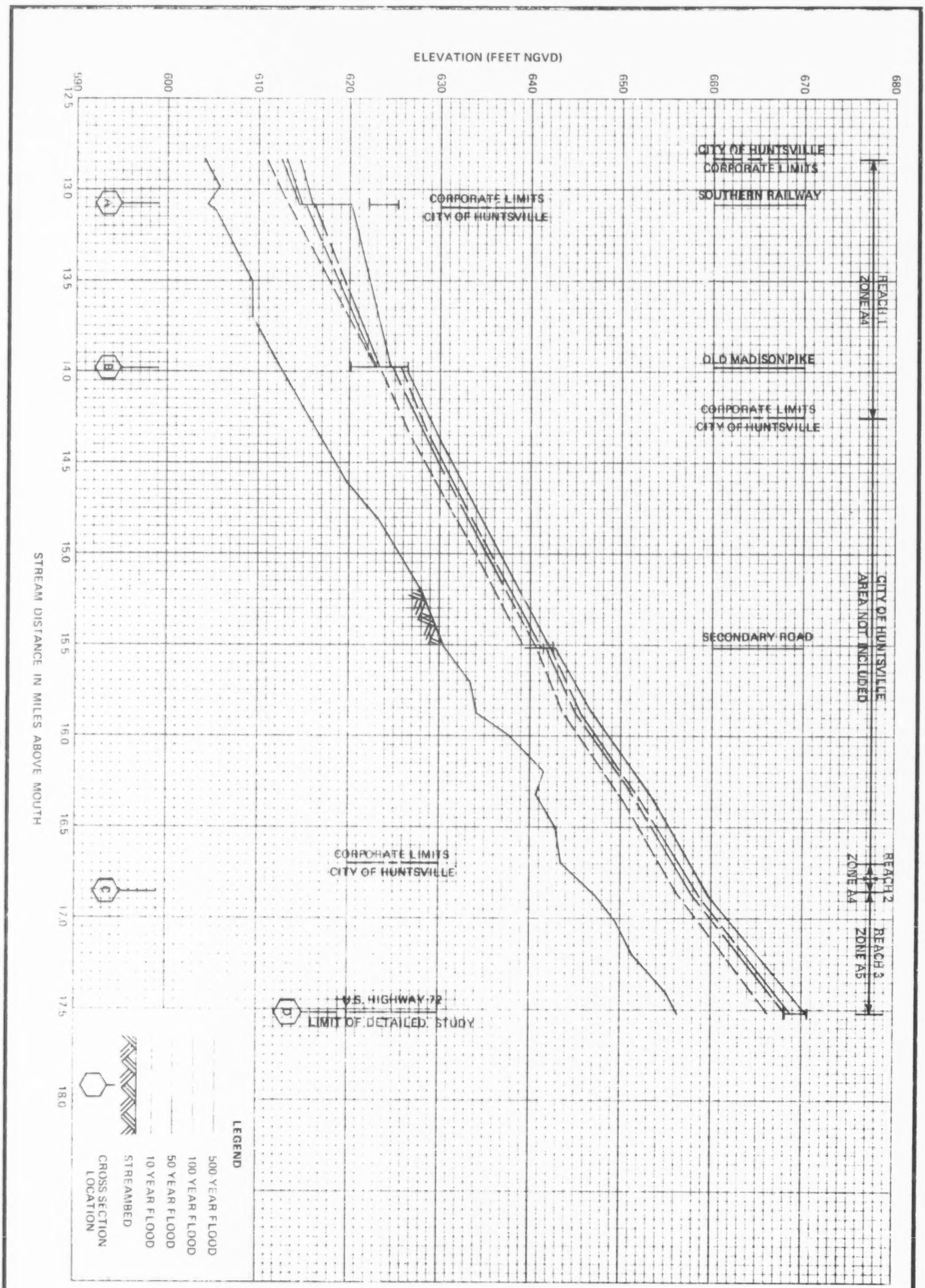
FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL
(UNINCORPORATED AREAS)

FLOOD PROFILES

BEAVERDAM CREEK



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FEDERAL EMERGENCY MANAGEMENT AGENCY

MADISON COUNTY, AL

(UNINCORPORATED AREAS)

FLOOD PROFILES

INDIAN CREEK